CLAIMS

What is claimed is:

1. A process for forming a coherent refractory mass on the surface of a road comprising the steps of:

mixing one or more non-combustible materials with one or more metallic combustible powders and an oxidizer;

igniting the mixture so that the combustible particles react in an exothermic manner with the oxidizer and release sufficient heat to form a coherent refractory mass under the action of the heat of combustion; and

projecting said mass onto the surface of the road so that the mass adheres durably to the surface of the road.

2. The process of claim 1 wherein the non-combustible material is selected from the group consisting of titanium dioxide, aluminum oxide, chromium oxide, silicon dioxide and magnesium oxide or a mixture of two or more thereof;

and wherein the combustible powder is selected from the group consisting of aluminum, silicon, zinc, magnesium and chromium or a mixture of two or more thereof.

3. The process of claim 2 wherein the oxidizer is selected from the group consisting of air, oxygen, ammonium perchlorate, ammonium nitrate, potassium perchlorate, potassium nitrate, sodium perchlorate, sodium nitrate, potassium chlorate and sodium chlorate.

4. The process of claim 1 wherein the non-combustible material is chromium oxide produced from refused grain brick.

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5. The process of claim 2 wherein the non-combustible material is refused grain brick known commercially as Cohart RFG or Cohart 104 Grades.

6. The process of claim 1 wherein the non-combustible material is Magnesite regenerate.

7. The process of claim 1 wherein the non-combustible material is Corhart-Zac.

8. The process of claim 1 wherein the non-combustible material is Al2O3-/Bauxite-Regenerate.

9. The process of claim 1 wherein the oxidizer contains an anti-caking or flow agent.

10. The process of claim 9 wherein the flow agent is TCP (Tricalcium Phosphate).

11. The process of claim 1 wherein Iron Oxide (FE2O3) is used as a catalyst in the mixture.

12. The process of claim 1 wherein the mixing step includes introducing a coloring material to the mixture which when heated in the presence of the other materials causes the color of the refractory mass to be a predetermined color.

13. The process of claim 12 wherein the color is yellow.

14. The process of claim 12 wherein the coloring material is tungsten.

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15. The process of claim 12 wherein the coloring material is zirconium.

16. The process of claim 1 wherein the igniting step includes igniting the mixture in a combustion chamber.

17. The process of claim 16 including the step of supplying oxygen to the combustion chamber to assist in the burning of the one or more metallic combustible powders.

18. The process of claim 1 wherein the mixing step is accomplished in the combustion chamber.

19. The process of claim 1 wherein the mixing step is accomplished prior to entry of the mixture into the combustion chamber.

20. The process of claim 1 including the step of preheating the surface of the road prior to projection of the refractory mass onto the surface of the road.

21. The process of claim 1 including the step of adding retroreflective beads to the refractory mass prior to projecting the mass onto the surface of the road.

22. The process of claim 1 including the step of depositing retroreflective beads upon the refractory mass after the mass has been projected onto the road surface.

23. The process of claim 1 including the step of controlling the rate of deposition of the refractory mass such that the mass projected upon the road surface has a substantially uniform thickness.

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24. The process of claim 21 wherein the retroreflective beads added to the mixture are softened by the heat of reaction to cause the beads to adhere durably to the surface of the road.

25. Apparatus for forming a coherent refractory mass on the surface of a road, the apparatus comprising:

a combustion chamber adapted to be disposed on a surface of a road;

a first supply line for transporting one or more metallic combustible powders and one or more non-combustible materials to the combustion chamber;

a second supply line for transporting an oxidizer to the combustion chamber; and

an igniter associated with the combustion chamber and operative to ignite the combustible powder, non-combustible material and oxidizer in the combustion chamber to cause the metallic combustible powder to react in an exothermic manner with the oxidizer and release sufficient heat to form a refractory mass which is projected against the surface of the road so that the mass adheres durably to the road surface.

26. The apparatus of claim 25 wherein the first supply line includes a carrier for transporting the combustible powder from the first container to the combustion chamber; and

wherein the second supply line includes a carrier for transporting the oxidizer from the second container to the combustion chamber.

27. The apparatus of claim 25 including a third supply line for supplying air to the combustion chamber to supply additional oxygen and to assist in projecting the refractory mass against the surface of the road.

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28. The apparatus of claim 25 including a third supply line for supplying additional oxygen to the combustion chamber to assist in the burning of the metallic combustible powder(s).

29. The apparatus of claim 26 including a third supply line for supplying air to the combustion chamber to supply additional oxygen to assist in projecting the refractory mass against the surface of the road.

30. The apparatus of claim 25 including an additional supply line for supplying a coloring material to the mixture, which when heated in the presence of the other materials causes the color of the refractory mass to be yellow.

31. The apparatus of claim 30 wherein the coloring material is tungsten.

32. The apparatus of claim 30 wherein the coloring material is zirconium.

33. The apparatus of claim 26 wherein the carrier in the first supply line and second supply line is air.

34. The apparatus of claim 25 wherein the igniter is an electric arc.

35. The apparatus of claim 25 wherein the igniter is a gas pilot light.

36. The apparatus of claim 25 wherein the rate of delivery of the metallic combustible powder(s) is controlled by a screw conveyor driven by a variable speed motor.

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37. The apparatus of claim 25 wherein the oxidizer is a powdered oxidizer and the rate of delivery of the powdered oxidizer is controlled by a screw conveyor driven by a variable speed motor.

38. The apparatus of claim 25 wherein the rate of delivery of the metallic combustible powder(s) is controlled by means of a variable valve which controls a gas carrier.

39. The apparatus of claim 25 wherein the oxidizer is a powdered oxidizer and the rate of delivery of the powdered oxidizer is controlled by a variable value that controls a gas carrier.

40. The apparatus of claim 28 wherein the delivery rate of oxygen is controlled by a variable valve.

41. The apparatus of claim 25 including a line painting assembly associated with the apparatus and wherein the rate of deposition of the coherent mass onto the road surface is controlled by the speed of the line painting assembly along the road surface.

42. The apparatus of claim 25 including a separate supply line to transport retro-reflective beads to the combustion chamber so that the heat of reaction softens the surface of the retro-reflective beads and causes the beads to adhere durably to the surface of the road.

43. The apparatus of claim 42 wherein the retro-reflective beads are injected into the hottest part of the combustion chamber so that the heat of reaction softens the surface of the retro-reflective beads and causes the beads to adhere durably to the surface of the road.

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44. The apparatus of claim 42 wherein the retro-reflective beads are injected into a cooler portion of the combustion chamber wherein the temperature is sufficient to soften the surface of the retro-reflective beads and causes the beads to adhere durable to the surface of the road but the temperature is insufficient to cause a major distortion or destruction of the retro-reflective beads.

45. The apparatus in claim 25 wherein one supply line contains a carrier to transport the oxidizer and part of the non-combustible materials.

46. The apparatus in claim 25 wherein one supply line contains a carrier to transport the metallic combustible powder(s) and part of the non-combustible materials.

47. The apparatus of claim 25 wherein the combustion chamber is made of a ceramic material.

48. The apparatus of claim 25 wherein the combustion chamber contains openings which act as venturi to draw in air and cool the inside surface of the combustion chamber.

49. The apparatus of claim 25 wherein the combustion chamber is made of metal that is coated on the inside with a ceramic coating.

50. A road marking composition comprising at least one non-combustible dry powder and at least one combustible dry powder wherein when the mixture is ignited in the presence of an oxidizer the combustible powder reacts in an exothermic manner with the oxidizer and releases sufficient heat to form a refractory mass under the action of the heat of combustion and cause the refractory mass to adhere durably to the surface of a road.

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51. The composition of claim 50 wherein the non-combustible powder is selected from the group consisting of titanium dioxide, aluminum oxide, silicon dioxide, chromium oxide, and magnesium oxide or a mixture of two or more thereof;

and wherein the combustible powder is selected from the group consisting of aluminum, silicon, zinc, magnesium and chromium or a mixture of two or more thereof.

52. The composition of claim 50 where the oxidizer is selected from the group consisting of air, compressed oxygen, liquid oxygen, ammonium perchlorate, ammonium nitrate, potassium perchlorate, potassium nitrate, sodium perchlorate, sodium nitrate, potassium chlorate and sodium chlorate or a mixture of two or more thereof.

53. The composition of Claim 50 wherein the non-combustible powder is known commercially as Cohart RFG or Cohart 104 Grades.

54. The composition of claim 50 where the non-combustible material is Magnesite regenerate.

55. The composition of Claim 50 where the material is aluminum oxide/Bauxite-Regenerate.

56. The composition of claim 50 including iron oxide used as a catalyst in the mixture.

57. The composition of claim 50 including a coloring material which when heated in the presence of the other materials causes the color of the refractory mass to be a predetermined color.

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58. The composition of Claim 57 wherein the resulting color is yellow, red or blue.

59. The road marking composition of claim 50 comprising titanium dioxide and aluminum.

60. The road marking composition of claim 50 comprising silicon dioxide and aluminum.

61. A road marking composition comprising a non-combustible material selected from the group consisting of titanium dioxide, aluminum oxide, chromium oxide, silicon dioxide and manganese oxide or a mixture of two or more thereof, and a combustible powder selected from the group consisting of aluminum, silicon, zinc, magnesium and chromium or a mixture of two or more thereof.

62. For use in the process of claim 1 a road marking composition comprising a non-combustible material selected from the group consisting of titanium dioxide, aluminum oxide, chromium oxide, silicon dioxide and magnesium oxide or a mixture of two or more thereof, and a combustible powder selected from the group consisting of aluminum, silicon, zinc, magnesium and chromium or a mixture of two or more thereof.

63. The road marking composition of claim 50 compromising are aluminum oxide and aluminum.

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FAX. (617) 451-0313